

be moved up or down in guides, and served to produce waves. A movable apparatus indicated on a cylinder the movements of the surface at any point; the moment of immersion was also indicated. The following results were arrived at:—1. If the body be drawn out and a wave of depression produced, a whole series of other waves follows this, which are of gradually decreasing height. 2. Both the primary and the secondary waves are, from a certain distance from the origin onwards, propagated with uniform velocity, which, for the same depth, is independent of the mode of the immersion. The first primary wave has the greatest velocity; it coincides with that resulting from Lagrange's calculations. The velocity of the others decreases from wave to wave, so that their length increases proportionally to the distance from the origin. 3. The depth of the first wave is proportional to the volume brought out of the position of equilibrium; and it decreases inversely as the square root of the distance from the origin (this corresponds to Boussinesq's development). 4. The profile of each secondary wave is a sinusoid, but that of the primary is much more complicated. These results are in contradiction to nearly all analytical results on wave motion. The author is prosecuting his inquiry further.

In an interesting memoir presented to the Belgian Academy, on the influence of the form of masses on their attraction, M. Lagrange arrives at the following theorem, which he considers as fundamental for the mechanical theory of crystallisation: A mass of any form, at a distance from its centre of inertia, acts with maximum, mean, and minimum energies in three rectangular directions, and these directions coincide respectively with the three axes of maximum, mean, and minimum inertia of the mass; the attraction diminishing the more rapidly the less the mass in question. M. Lagrange offers some preliminary considerations on the structure of bodies, and one curious consequence of his formulae is that the molecules of a body are not always distributed symmetrically with regard to the three rectangular directions, owing to the influence of certain secondary axes of attraction, which is combined with that of the principal axes of inertia. The principal modes of crystallisation of bodies seem to M. van der Mensbrugghe (who reports on the memoir), in perfect harmony with the classification of molecular groups, (1) according to their principal axes of inertia, (2) according to their secondary axes of attraction. M. Lagrange promises, in an early work, a complete solution of the problems of crystallisation of bodies.

M. THOLLON has recently observed, by the aid of his spectroscope of high dispersive power, a solar protuberance whose height equalled one-sixteenth of the diameter of the sun, or about 55,000 miles.

HERR EDELMANN describes, in Carl's *Repertorium*, a novel quadrant electrometer in which the needle, instead of being a flat plate, consists of two quadrants cut vertically from a cylinder. This swings concentrically within another cylinder slit into four quadrants, which replace the usual pairs of flat quadrant plates. The needle and its attached mirror are supported by a bifilar suspension, and the charge is given to the needle by connecting the cup of concentrated sulphuric acid, into which it dips, with the pole of a Zamboni pile. This latter arrangement is simpler than the usual replenisher and gauge of the well-known Thomson electrometers, but cannot be anything like as reliable.

HERR BÖTTGER describes a process for steeling copper plates by electrolysis. 100 parts of ferrous-ammonia sulphate, together with 50 parts of sal-ammoniac, are dissolved in 500 parts of pure water, a few drops of sulphuric acid being added to acidulate the solution. The copper plate connected to the negative pole of a battery of two or three Bunsen elements, an iron plate of equal size being employed as an anode. The solution is maintained at from 60° to 80°. The deposit of iron is of a hard steel-like quality, and is very rapidly formed.

PROF. GRAHAM BELL communicated a notice of "Some Experiments relating to Binaural Audition" to the recent meeting of the American Association for the Advancement of Science. The paper, which contains some extremely valuable observations, will be published in extenso in the *American Journal of Otology*.

#### GEOGRAPHICAL NOTES

A REUTER'S telegram from Halifax, Nova Scotia, states that arrangements are in progress there for a new American Arctic

Exploring Expedition, under the leadership of Dr. Emil Bessels, the scientific member of Capt. Hall's *Polaris* Expedition.

IN opening the proceedings of the Geographical Society on Monday evening, Lord Houghton read a letter from Sir Bartle Frere, in which he spoke in the highest terms of Dr. Emil Holub as the most competent traveller he had met for a long time, and in which he also expressed the opinion that, with the exception of a very small portion, the Valley of the Zambesi was well suited for Europeans in regard to climatic conditions. After an amusing sketch of his early experiences in South Africa, and a brief account of his two preparatory journeys, Dr. Holub delivered an address, describing vividly and in considerable detail his main journey, which occupied twenty-one months, from the Diamond Fields to the upper waters of the Zambesi. Among other matters, he thus explained how the River Zooga flows at one time to the east and at another to the west. When the Shallow Lake Ngami is filled up by the streams falling into it from the west, its waters pass through the Zooga to the salt lakes on the east, but when these streams do not pour in such an amount of water, the level of the lake becomes very low, and the Zooga, often largely increased in volume from the overflowing salt lakes, sends its waters into Lake Ngami. This solution of a curious phenomenon agrees, we believe, with the conclusion arrived at by Major Serpa Pinto. Dr. Holub dwelt for some time on the Marutse Empire, which he considered to be some 400 miles long and 450 broad, and the languages and customs of which he had ample opportunities for studying from his prolonged stay at Shesheke. When examining the country to the north of this place, Dr. Holub was unfortunately prostrated by severe illness, which compelled him to give up all further explorations in this interesting region. He made his return journey through the western Makalaka region of the Matabele country, about which he gave many particulars. Dr. Holub exhibited a very carefully drawn chart which he had made of part of the course of the Zambesi, and gave some information respecting his various collections. These include ethnographical objects, a large number of skins of birds and animals, fishes, insects, reptiles, &c., besides numerous botanical specimens. Dr. Holub hopes that before long he may have an opportunity of exhibiting his collections in London.

WE have received the first number of the new *Zeitschrift für wissenschaftliche Geographie*, edited by Herr J. I. Kettler, of Lahr, in Baden, assisted by an imposing staff of German geographers. We expected great things from this new journal, judging from the prospectus to which we referred some weeks ago; but we confess this first number disappoints us. Fifteen pages are devoted to a discussion of the first landing-point of Columbus, by Dr. R. Pietschmann, surely a great waste of space in a journal that professes to devote itself to scientific geography. The editor takes up seven pages with an article on the position of Brunswick; the old story of Severstoffs Ferghona expedition is related, and Dr. O. Krummel reproduces his discussion of the mean depths of the ocean, which has gone the round of the journals long ago. Behm's *Jahrbuch* for 1879, now out of date almost, is reviewed, and some old letters of Humboldt's are given, interesting only on the writer's account. An elaborate series of small charts are the only maps given, illustrating the paper on Columbus's landing-point. We trust the succeeding numbers will be both more scientific and more novel, else the new journal can scarcely justify its existence.

LAST week the French expedition commissioned to explore the Sahara in connection with the proposed railway left Paris for Marseilles, whence it will sail for Algeria. The expedition will devote its attention mainly to the country south of Wargla, which is too imperfectly known at present to enable a decision to be come to as to the precise route which the railway ought to take. The expedition is under the command of Lieut.-Col. Flatters, who is accompanied by an efficient scientific staff of engineers and others. They will be accompanied by an escort of trustworthy frontier Arabs. At the last meeting of the Paris Society of Commercial Geography, M. Masqueray, the Saharan explorer, gave some interesting information concerning the land of Adrar, in the Western Sahara. This he derived from three pilgrims on their way to Mecca, who had been plundered in the desert, and supplied with funds by the French Government in Algiers to continue their pilgrimage. On their return they have promised to conduct the French explorer to their country. Adrar, or Aderer, presents two or three of the chief aspects of the Sahara, which is by no means the universal desert at one time.

supposed. In the south-west are long bands of sand, not exceeding eight days' march in width. Adrar-Temar, the country of the travellers, is placed like a long and narrow island between two of these bands of sand. It is an almost level region, slightly elevated above the sands, which tend to encroach upon its borders. Intermittent streams are found in the country, and there are numerous towns or large villages, containing a considerable population. The three pilgrims represent their country as covered with gum-acacias, and ostriches greatly abound. The most important commercial fact in connection with Adrar is the existence at Ijl of an immense deposit of rock salt, which, as we advance towards the country of the negroes, becomes the most valuable article of trade. Tichu (?Tishit), some days' journey to the south-east of Ijl, is the principal market for the trade in salt, for which slaves are the principal exchange.

HERR CLEMENS DENHARDT, who has just returned to Germany from an exploring tour in Eastern Central Africa, has received a grant of 500 marks (20*l.*) from the Gesellschaft für Erdkunde, at Berlin, to defray the cost of publishing his notes of travel.

M. GRANDIDIER, the explorer of Madagascar, has been appointed president of the governing body (Section Centrale) of the Paris Geographical Society for 1879. Admiral La Ronciere Le Nourry has been continued president of the Society. The Geographical Society of Paris is preparing to hold a reception when Prof. Nordenskjöld arrives in France; but the first step will be taken by the Society of Marseilles, the city at which Nordenskjöld will land from Naples, according to all probability.

We learn from the last number of the *Izvestia* of the Russian Geographical Society that the expedition of M. Pyevtsoff to Mongolia was very successful. M. Pyevtsoff, after having stayed seven days at Koukou-khoto, started for Kalgan (in the south-east part of the Gobi steppe) where he remained for two months, studying the trade of China with Mongolia. Thence the expedition went to Urga, and from Urga to Ulassoutai, following thus a route which never was before explored. From Ulassoutai M. Pyevtsoff turned west to the Chuya river, which was reached at Kosh-agach; this route was quite unknown until now. On the whole thousand miles' distance between Urga and Kosh-agach the expedition made a survey, and M. Pyevtsoff determined the latitudes and longitudes of twelve points. On the whole the expedition has made, on its way from Khobdo to Kalgan and thence to Kosh-agach, no less than 2,700 miles of surveys, and determined astronomically the position of twenty-six points, all longitudes being determined as well by chronometers as by the occultations of stars. Barometrical measurements were made during the whole journey, and very rich zoological, botanical, and mineralogical collections were obtained.

THE St. Petersburg Geographical Society has received news from Col. Prjalsky, *via* Pekin. The intrepid traveller has safely arrived at Zaidam, on the Tibetan frontier, after having crossed the hitherto unknown country from Hami *via* Shatshau to Zaidam. From the latter place he will proceed to the interior of Tibet. News has also been received from the chief of the so-called Samara Expedition, referring to the readiness of the Chiwinz tribe to restore the old course of the Amu Darya by destroying the dykes on the lower part of the river. The expedition sent out by the Russian Government Office for Communications, under Col. Gluchowski, and charged with the investigation of the lower course of the Amu Darya, with a view to rendering it navigable in future, also begins to show signs of activity.

THE "Karl Stangen'sche Reisebüro," at Berlin, will publish a description of its first journey round the world (1878-79) early in March, this description to serve as a guide for future journeys and intending tourists.

#### THE EFFECTS OF UNINTERRUPTED SUN-LIGHT ON PLANTS

PROF. SCHÜBELER of Christiania, who for nearly thirty years has been engaged in observing the influence exerted by differences of climate on vegetation, has published the result of his observations in recent numbers of our Norwegian namesake, *Naturen*. The first of the series of his observations, which he has given in detail, refer to winter-wheat, and were undertaken with the special view of noting

what effect the almost unbroken sunlight of the short Scandinavian summers had on plants raised from foreign seed. The experiments were made with samples of grain from Bessarabia and Ohio, and in both cases it was found that the original colour of the grain gradually acquired each year a richer and darker colour—the difference being perceptible even in the first year's crop—until it finally assumed the yellow-brown tint of other home-grown Norwegian winter-wheats. Similar results were obtained with maize, different kinds of garden and field peas and beans, and certain other garden plants, as celery, parsley, &c. In no case has Dr. Schübeler found that an imported plant, capable of being cultivated in Norway, loses in intensity of colour after continued cultivation; while in regard to many of the common garden flowers of Central Europe, he believes it may be asserted with certainty, that after their acclimatisation in Norway, they acquire an increase of size, as well as an augmentation of colour. These altered conditions are more forcibly manifested the further north we go, within the limits of capacity of vegetation for different plants. Thus it has been observed by Prof. Wahlberg of Stockholm, that *Epilobium angustifolium*, *Lychnis sylvestris*, *Geranium sylvaticum*, and many other plants common to Lapmark and the more southern districts of Sweden, attain in the former a size and brilliancy of tint unknown in the latter. The change in the case of *Veronica serpyllifolia* and *Trientalis europaea* is remarkable; the former changing as it goes further north from a pale to a dark blue, and the latter from white to rose-pink. It is noteworthy that a tinge of red is a common characteristic of the vegetation of the Scandinavian Fjelds; this being observable alike in blue, yellow, green, and white colours.

Colour is not, however, the only property affected by the unbroken continuance of daylight in the summers of Scandinavia, for according to Dr. Schübeler, the aroma of all wild and cultivated fruits, capable of cultivation in the northern lands, is much greater than that of the same fruits when grown in more southern countries. This is especially observable in regard to strawberries, cherries, and the various kinds of wild marsh and wood berries. In corroboration of this, Prof. Flückiger of Strassburg has found that the Norwegian juniper yields a much larger amount of essential oil than can be obtained from the shrub when grown in Central Europe. This excess of aroma in northern plants and fruits co-exists with an inferior degree of sweetness; thus the common golden-drop plum, and the greengage of Christania, or Throndhjem, although large, well-coloured, and rich in aroma, are so deficient in sweetness as to seem unripe to those who have eaten these fruits in France, or Southern Germany.

Dr. Edmond Göze, who has long been resident at Coimbra, informs Dr. Schübeler, that his observations on the fruits of Portugal enable him to corroborate that observer's opinion in regard to the different conditions on which aroma and sweetness respectively depend. The strawberries grown in large numbers near Coimbra are, he says, of great size, extremely sweet, but almost wholly deficient in aroma and flavour. The same remark refers to the Portuguese wines, when compared with the highly flavoured yields of the Rhenish and other northern vineyards; and a consideration of these varying conditions leads him to accept as an established fact, that light bears the same relation to aroma, as heat does to sweetness.

This increase of aroma, or intensification of flavour, due to the uninterrupted action of the sun's light, has the effect of making some of our most savoury garden plants almost uneatable in Scandinavia. Thus Dr. Schübeler has found that common white stick-celery, which had been grown near Christania with careful attention to the methods followed in England, and which in outward appearance could not be distinguished from plants brought direct from Covent Garden Market, had a sharp unpleasant taste, when compared with the milder and more agreeably flavoured English plants. The same result was observed in garlic, shallots, and onions, and although it must be admitted that as the expressions of mere individual taste, the writer's conclusions in regard to this point are open to doubt, it should at the same time be borne in mind that they are based on practical observations and experiments, continued for nearly thirty years, and confirmed by the concurrent testimony of several of his colleagues, who, like himself, were desirous of deducing practical results from the acclimatisation of plants in Norway. From this point of view, some of Dr. Schübeler's observations are especially interesting, and in the present low condition of Norwegian industrial development, their practical